

REMARKS

Claims 1, 3, 5-8, and 12-28 are pending in this application. Claims 1, 12, 18 and 24 are independent.

Claim Objection

Claim 8 has been objected to for depending on canceled claim 4. Accordingly, claim 8 has been amended to depend from claim 6.

Claim Rejection – 35 USC 102(e)

Claims 1, 3, 5, 7, 12, 13, 15, 24-26, and 28 have been rejected under 35 U.S.C. 102(e) as being anticipated by Etoh (U.S. Patent 6,157,408). Applicants respectfully traverse this rejection.

Summary of the Present Invention

The present invention, in a preferred embodiment, is directed to a high speed image sensor (e.g., see Figs. 1-3) comprising a plurality of signal converters (e.g., photodiodes 30a, 30b, etc.), and a plurality of electric signal recorders (e.g., CCD elements 34). The electric signal recorders are linear shaped and provided with a read-out line (e.g., branched lines 58a) for each of longitudinal sections thereof (e.g., CCD transfer paths 33a, 33b, etc.). As an example, in the embodiment shown in figure 2, the CCD transfer path 33a has ten CCD elements 34 for each pixel, and traverses over six pixels. In that example, the CCD transfer

path 33a holds 60 image frames (present specification, page 24, first full paragraph). The read-out line being used for directly reading the electric signals out of the longitudinal sections forming a light receptive area (e.g., Fig. 1).

Etoh

Etoh is directed to an image sensing apparatus having sensors 23 of pixels 20 constituting a photo-receptive area 21. The image sensing apparatus further includes signal storage/read-out CCDs 24A to 24F, arranged in a vertical direction, which signals are transferred to horizontally arranged CCDs 32A to 32F (e.g., see Figures 6 and 7).

Differences over Etoh

It appears from the sections and drawings indicated in the Office Action that Etoh's sensor 23 is believed to teach the claimed signal converters, Etoh's signal storage/read-out CCD's 24A to 24F are believed to teach the claimed electric signal recorders and the photo receptive area 21 is believed to teach the claimed light receptive area 21. Applicants submit, however, that Etoh fails to teach or suggest the claimed read-out line for each of longitudinal sections of the electric signal recorders, the read-out line being used for directly reading the electric signals out of said longitudinal sections of the electric signal recorders, as recited in claims 1 and 12.

In Etoh, CCDs 24A to 24F are arranged in a vertical direction and connected in series so that electric signals are transferred to horizontal CCDs 32A to 32F (e.g., see Figure 6). In the claimed invention, on the other hand, electric signals stored in each of the longitudinal sections are read-out through one of the read-out lines (e.g., branched lines 58a). In other words, the electric signals stored in each of the longitudinal sections are read-out without passing through other transfer paths (e.g., other CCDs) specialized for reading out. This claimed configuration enables the read-out operation to be directly from each of the transfer paths (see paragraph bridging pages 28 and 29).

Thus, Applicants submit that Etoh fails to teach each and every element of claims 1 and 12. Such a deficiency applies as well to claims dependent on claims 1 and 12.

Claim 24 is directed to an embodiment, shown for example in Figure 16, where each of the signal converters is divided into a plurality of portions insulated from each other. Figure 16 shows photodiodes 130a, 130b, 130c, and 130d as part of photo sensor 131, being insulated by a channel stop (See disclosed Fourth embodiment, paragraph bridging pages 42 and 43).

The Office Action refers to sections at col. 8, col. 9, col. 12, col. 13, and col. 19 of Etoh for teaching signal converters divided into a plurality of portions insulated from each other. Applicants disagree. In none of

those sections is it disclosed that the CCDs are insulated from each other.

Thus, Applicants submit that Etoh fails to teach each and every element of claim 24. This deficiency applies as well to claims dependent on claim 24.

Similarly, with respect to claims 7 and 15, Applicants submit that Etoh fails to teach or suggest at least the claimed "each of said signal converters is divided into a plurality of portions insulated from each other" (described, for example, with respect to Figure 16). In that drawing, photo sensor 131 is shown divided into photodiodes 130, insulated from each other by a channel stop. The Office Action relies on Figure 3's square areas A1 to A16. However, Etoh does not disclose that the square areas are insulated from each other. Thus, at least for this reason Etoh fails to teach each and every element of claims 7 and 15.

Accordingly, Applicants respectfully request that the rejection be withdrawn.

Claim Rejection – 35 USC 103; Etoh

Claims 18, 19, 21, and 27 have been rejected under 35 U.S.C. 103(a) as being obvious over Etoh in view of Applicants' own prior art figure 24. Applicants respectfully traverse this rejection.

Claim 18 is directed to a high-speed image sensor (Figure 2) comprising a plurality of signal converters (e.g., photodiodes 30a, 30b)

and a plurality of electric signal recorders (e.g., CCD elements). The signal converters are disposed in all of, or every other, square or rectangular frames on a light receptive area (e.g., square pixel array). A center line of each electric signal recorder (e.g., Fig. 1, bold line having white arrows), in a direction from one position where electric signals are input from a signal converter (e.g., input gate 32a) to another position where electric signals are input from an adjacent signal converter (e.g., input gate 32b), is inclined with respect to a line connecting two positions where electric signals are input from two of said signal converters, adjacent to each other in an extension direction of said electric signal recorders, to corresponding electric signal recorders (see page 27, first full paragraph).

The Office Action states that figures 19 and 20 of Etoh show a center line of each electric signal recorder inclined with respect to a line connecting two of the signal converters, adjacent to each other in an extension direction. Applicants disagree.

The meanders shown in figures 19 and 20 of Etoh do not constitute a center line inclined with respect to a line connecting two positions where electric signals are input from two of said signal converters, adjacent to each other in an extension direction of said electric signal recorders.

Furthermore, the invention of claim 18 is a solution to parallel arrangements between signal converters and signal recorders which

require a bridging connection, resulting in indirect charge transfer. For example, in figure 16 of Etoh, a bridging wiring is required between sensors 23 and corresponding charge storage 55, resulting in incomplete charge transfer (present specification, page 26, line 16, to page 27, line 1). Similarly, as can be seen in prior art figure 23, a horizontal transfer path 5 is required to feed the vertical transfer paths 6, having a problem of alternate direction of charge transfer (present specification, page 27, lines 1-6). Such indirect charge transfer leads to difficulty in achieving high speed transfer of information (present specification, page 27, lines 6-9).

Thus, at least for these reasons, Applicants submit that Etoh, as well as the disclosed prior art in the present application, fail to teach or suggest the invention of claim 18. In particular, Applicants submit that Etoh as well as the disclosed prior art in the present application fail to show a center line of each electric signal recorder is inclined with respect to a line connecting two positions where electric signals are input from two of said signal converters, adjacent to each other in an extension direction of said electric signal recorders, to corresponding electric signal recorders. Such deficiencies apply to claims dependent on claim 18 as well.

Accordingly, Applicants respectfully request that the rejection be withdrawn.

Claim Rejection – 35 USC 103; Etoh and Tanaka

Claims 6, 8, 14, 16, 20, and 22 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Etoh and Tanaka (U.S. Patent 6,674,470). Applicants respectfully traverse this rejection.

Tanaka is relied on for teaching a MOS-type solid state imaging device. However, Applicants submit that Tanaka fails to make up for the above stated deficiencies in Etoh. Thus, Applicants submit that the rejection fails to establish *prima facie* obviousness. Accordingly, Applicants respectfully request that the rejection be withdrawn.

Claim Rejection – 35 USC 103; Etoh and prior art fig. 24

Claims 17 and 23 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Etoh in view of Applicants' own prior art figure 24. Applicants respectfully traverse this rejection.

Claim 17, as well as claim 23, are directed to the high-speed image sensor further comprising a cuttable band-shaped space which continuously extends from one side to another side of the light receptive area. Such an arrangement is shown for example in Figure 11 and discussed on pages 35 to 37. The arrangement in figure 11 is such that an elongated region with neither electrode nor wires along the center lines 83 and 84 is produced (page 36, lines 19-22). The region leaves a sufficiently large space around the photodiode that layout changes can be done or defect-free portion can be taken out (page 37, lines 1-7).

The Office Action relies on figure 24 in the present application for teaching a sensor comprising a cuttable band-shaped space extending from one side to another side of the light receptive area. Applicants disagree.

As stated in the present specification, image sensors shown in Figures 24, 25A and 25B cannot be cut because the photodiode is shifted in position a little horizontally so that a line connecting these diodes intersect with the center line (page 37, lines 16-20). Thus, Applicants submit that Etoh and the disclosed prior art figure 24 fail to teach each and every claimed element of claims 17 and 23 and submit that the rejection fails to establish *prima facie* obviousness. Accordingly, Applicants respectfully request that the rejection be withdrawn.

CONCLUSION

All objections and rejections raised in the Office Action having been addressed, it is respectfully submitted that the present application is in condition for allowance and such allowance is respectfully solicited. Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert W. Downs (Reg. No. 48,222), to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

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overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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